AMERICAN JOURNAL OF DIAGNOSTIC IMAGING
2026; 12(1): 6-14
10.5455/ajdi.1763392952

WisdomGale

ORIGINAL ARTICLE

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Sonographic sliding sign as a predictor of intra-abdominal adhesions and surgical outcomes in repeat cesarean deliveries: A study from Kilimanjaro Christian Medical Center

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ABSTRACT

Aim: This study evaluated the diagnostic accuracy and reliability of the sonographic sliding sign (SSS) in predicting intra-abdominal adhesions and its association with immediate postoperative outcomes in third-trimester women undergoing repeat cesarean section at Kilimanjaro Christian Medical Center.

Methods: In a prospective cohort of 265 women, the presence or absence of the sliding sign was assessed using transabdominal ultrasound and compared with surgical findings as the gold standard from May 2024 to May 2025, with the data collection period starting from November 2024 and ending in April 2025, followed up by data analysis.

Results: The SSS demonstrated a strong diagnostic performance for detecting adhesions, with a sensitivity of 81.8%, specificity of 88.3%, positive predictive value of 88.2%, negative predictive value of 81.9%, and an area under the curve of 0.85. When assessed for its ability to predict adhesion severity, the tool showed a sensitivity and specificity of 81.9% and 89.8% for no/mild adhesions, 61.5% and 92.0% for moderate adhesions, and 73.3% and 92.0% for severe adhesions, respectively. Inter- and intra-observer reliability were substantial, with Cohen's Kappa values of 0.64 and 0.76. A negative sliding sign was significantly associated with longer skin-to-delivery times (mean difference: 4.03 minutes, $p = 0.001$) and longer total operating times (mean difference: 14.2 minutes, $p < 0.001$).

Conclusion: These findings underscore the sliding sign as a reliable, non-invasive, and clinically useful tool for preoperative planning in repeat cesarean deliveries, particularly in resource-limited, high-parity settings. Routine use may aid in optimizing surgical preparedness and improving maternal outcomes.

ARTICLE HISTORY

Received November 17, 2025
Accepted December 17, 2025
Published January 29, 2026

KEYWORDS

Adhesions; cesarean delivery; KCMC; sonographic sliding sign; ultrasound

Introduction

Cesarean section stands as the most frequently performed abdominal surgical procedure, with a globally increasing incidence [1]. In recent decades, cesarean delivery rates have steadily increased worldwide, with a significant proportion of women undergoing multiple cesarean deliveries during their reproductive years. It has been estimated that from 2000 to 2015, the estimated rate of global cesarean deliveries almost doubled from 12.1% to 21.1% [2].

In Tanzania, the rising trend has also been seen with the percentage of live births from cesarean deliveries rising from 7% in 2015 to 11% in 2022, with 30% of the deliveries occurring in the

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Kilimanjaro region, which was the second-highest percentage distribution by region [3].

While cesarean delivery is often necessary to safeguard the health of both mother and baby, it carries the risk of complications, among which adhesion formation is prominent. Studies have shown that the prevalence of severe adhesions following primary cesarean delivery is substantial, reported at 56%, and escalates with each successive cesarean delivery [1].

Adhesions pose considerable challenges during subsequent procedures. Women with severe adhesions experience increased operation time, infant delivery time, and blood loss during cesarean deliveries [4]. Higher adhesion scores thus have been associated with worse surgical outcomes for both mother and child among women undergoing repeat cesarean deliveries [5].

The morbidities associated with intra-abdominal adhesions have prompted the development of different predictors that would enable the preoperative prediction of the presence of intra-abdominal adhesions.

It has been shown that abdominal striae and surgical scar characteristics may be associated with intra-abdominal adhesions; however, studies showing this association have been scarce, and the results have been inconsistent [6–9].

Recently, a new simple sonographic technique has been postulated to predict intra-abdominal adhesions in women with a history of a previous cesarean section. Studies have shown a sensitivity of 53.3%–100% and a specificity of 80.4%–100% for the detection of intra-abdominal adhesions by the Sonographic sliding sign (SSS) in women set to undergo a repeat cesarean delivery [10–13].

As ultrasound is becoming readily accessible in the clinical setting, the preoperative SSS presents itself as a highly potential method that could detect women with a preoperative risk for intra-abdominal adhesions during repeat cesarean delivery. The use of the SSS to predict intra-abdominal adhesions in this population of women will thus aid in clinical decision making [12].

Predicting adhesions will allow for improved surgical planning and facilitate improved clinical outcomes by enhancing the perioperative decision process with regard to the timing of surgery, experience of the leading surgeon, anesthetic team, anesthesia type, surgical approach, blood product availability, and the anticipated higher level of attention required for women with suspected intra-abdominal adhesions [10,11].

Materials and Methods

Patients

The study was a prospective cohort study that was conducted at Kilimanjaro Christian Medical Center (KCMC) from May 2024 to May 2025, with the data collection period starting from November 2024 to April 2025. The study included all pregnant women in their third trimester attending KCMC who were scheduled for and underwent a repeat cesarean delivery. Women who did not consent to the study, had connective tissue disorders, or placenta accreta spectrum were excluded from the study.

Sample size was calculated using Buderer's formula to estimate sensitivity and specificity [9], with the expected prevalence of intra-abdominal adhesions [1] yielding a sample of 275 participants, accounting for a 10% dropout rate. Eligible clients accessible to the principal investigator who met the inclusion and exclusion criteria were then consecutively recruited from the antenatal ward as they were admitted for repeat cesarean delivery, until the required sample size was reached.

Instruments and methods

A detailed clinical history was taken to obtain relevant maternal characteristics, and these were recorded in a numbered questionnaire for anonymity. A preoperative ultrasound was performed by the principal investigator (Senior resident) using a GE Voluson S8 (2–8) MHz RAB6 curved array transducer to assess fetal biometrics and wellbeing according to departmental protocol before conducting the visceral sliding test [10]. Scanning was performed regardless of bladder fullness, and the transducer was positioned in the midline, either 3 cm above and perpendicular to transverse scars or 8 cm above the pubic symphysis for supraumbilical midline (SUMI) scars [10]. A plane demonstrating the anterior uterine wall and anterior abdominal muscles was obtained. Patients were asked to take deep breaths and exhale while the examiner observed for sliding of the uterine wall beneath the parietal peritoneum and fascia transversalis over two respiratory cycles [10,12,14]. Cine clips covering both respiratory cycles were recorded to evaluate intra- and inter-observer agreement.

Ultrasound findings were documented on a numbered questionnaire that was not accessible to the surgeons. Following surgery, surgeons blinded to ultrasound findings documented on intraoperative adhesions using Zühlke et al's [15] grading and

immediate postoperative outcomes on a separate questionnaire bearing the same patient identification number. The two datasets were later matched and compiled for analysis, maintaining blinding throughout the process.

Interpretation of findings

A sliding sign was said to be present when sliding of the uterus caudally against the abdominal wall muscles was seen. A positive sliding sign with free movement, defined as movement ≥2 cm in the longitudinal plane and represented no/mild intra-abdominal adhesions. A negative sliding sign was defined as when sliding was <1 cm, and this represented severe intrabdominal adhesions. Between 1 and <2 cm, a prediction of moderate adhesions was made, and this was termed the positive sliding sign with restricted movement [10]. Recorded cine clips were reviewed by the supervising senior radiologists for inter observer reliability; discordant results were settled by agreement with a second senior radiologist [10,12,16]. Recorded cine clips were reassessed at least 1 month after the first ultrasound evaluation by the principal investigator for intra observer reliability [12].

Statistical analysis

All analyses were conducted using SPSS version 26. Descriptive statistics summarized participant characteristics: categorical variables as frequencies/percentages, and continuous variables as mean ± SD (normal distribution) or median with IQR (non-normal distribution).

Diagnostic accuracy of the sliding sign was evaluated through sensitivity, specificity, PPV, NPV, and ROC curve analysis (AUC calculation), using intraoperative adhesion evidence during repeat cesarean as the gold standard. Kappa statistics assessed for reliability. Group comparisons (negative *vs.* positive sliding sign) employed Student's *t*-test or Wilcoxon rank-sum test for continuous outcomes and Chi-square or Fisher's exact test for categorical variables. All inferential tests used a 5% significance threshold ($p < 0.05$).

Results

A total of 277 participants were initially recruited for the study. However, four participants declined to provide consent and were therefore excluded. Additionally, six participants delivered via spontaneous vaginal delivery after scanning and were excluded as well. One participant had not undergone surgery by the end of the data collection period and was also excluded. As a result, 265 participants with complete data were included in the final analysis (Fig. 1).

Demographic and obstetric characteristics of study participants

Among the 265 participants, the majority, 188 (70.9%), were women aged 18–34 years, with a mean age of 31.3 years (SD ± 6.8). Most participants had a parity of 1 or 2, accounting for 105 (39.6%) and 103 (38.9%), respectively, with a median parity of 2 (IQR: 1–2). A small proportion, 11 (4.2%), reported a history of surgeries other than cesarean section. The average number of previous cesarean sections was 1.5 (SD ± 0.8), and Pfannenstiel incisions were the most common incision type, accounting for 83.4% of all incisions, as shown in Table 1.

Ultrasound detected adhesions in 127 of 265 participants (47.9%), compared to 137 (51.7%) found intraoperatively. Its diagnostic accuracy varied by adhesion grade. For no/mild adhesions, sensitivity was 81.9% (95% CI: 74.7–87.5) and specificity 89.8% (95% CI: 84.7–93.5). For moderate adhesions, sensitivity was lower at 61.5% (95% CI: 47.0–74.4), but specificity remained high at 92.0% (95% CI: 87.7–95.2). For severe adhesions, sensitivity was

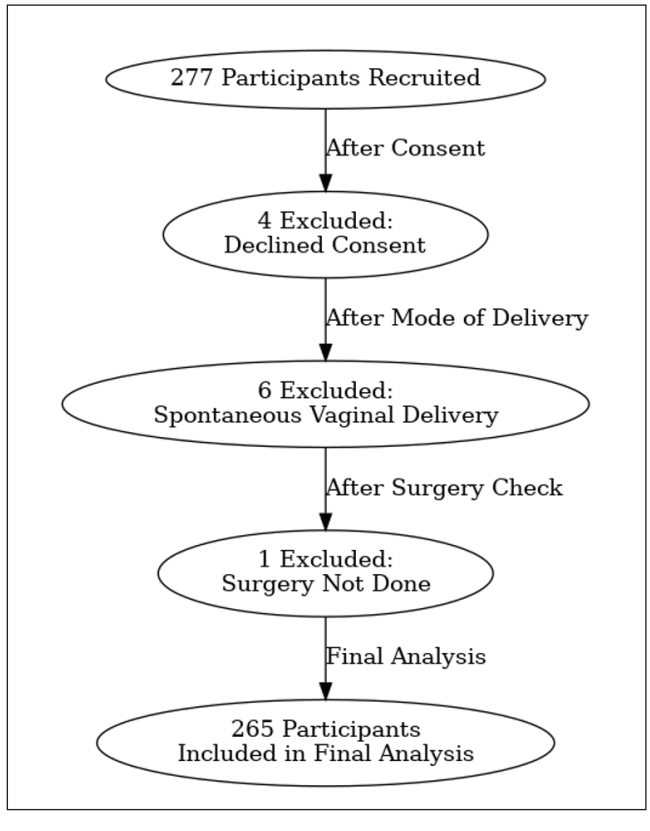


Figure 1. Participant recruitment flow chart.

Table 1. Demographic and obstetrics characteristics of study participants (*N* = 265). Diagnostic accuracy of the sonographic sliding sign.

Variable	Frequency (*n*)	Percentage (%)
Age in years		
<35	188	70.9
≥35	77	29.1
Mean (SD)	31.3(± 6.8)	
Parity		
1	105	39.6
2	103	38.9
3	43	16.2
4	8	3.0
5	5	1.9
6	1	0.4
Median (IQR)	2(1-2)	
Incision type		
Pfannenstiel	221	83.4
SUMI	44	16.6
Surgeries other than cesarean section (C/S)		
Yes	11	4.2
No	254	95.8
Number of cesarean section		
1	152	57.6
2	85	32.1
3	23	8.7
4	4	1.5
5	1	0.4
Mean (SD)	1.5(± 0.8)	
Gestation age		
Median (IQR)	38.0 (37-38)	

73.3% (95% CI: 61.4–83.1), and specificity was 92.0% (95% CI: 87.7–95.2). No/mild and severe adhesions were most accurately identified; moderate adhesions were the most challenging (Table 2).

By collapsing no/mild adhesions into a "no adhesions" category and moderate/severe into an "adhesions" category for overall analysis, ultrasound demonstrated strong diagnostic capability. It achieved a sensitivity of 81.8% (95% CI: 74.4%-87.3%), correctly identifying 112 out of 137 true adhesion cases, and a high specificity of 88.3% (95% CI: 81.6%–92.8%) correctly identifying 113 out of 128 true non-adhesion cases. Furthermore, the predictive capacity was robust, with a PPV of 88.2% (95% CI: 81.4%–92.7%) and a negative predictive value (NPV) of 81.9% (95% CI: 74.6%–87.4%) (Table 3).

Moreover, Figure 2 indicates the AUC for ultrasound Vs surgical findings in detecting adhesions was 0.85.

Intra-observer reliability of the SSS

Regarding the consistency in the identification of adhesions between the initial and repeated evaluations. 133 cases were consistently labeled as "No adhesion" by the observer in both initial and repeat ultrasound scans, and 100 participants were consistently labeled as "Adhesion" in both initial and repeat ultrasound scans. Cohen's Kappa indicated a statistically significant substantial agreement between the initial and repeat ultrasound findings, κ; 0.76, p value < 0.001 (Table 4).

Inter-observer reliability of ultrasound in identifying adhesions among women with repeated cesarean section.

Evaluation of the consistency in identification of adhesions through ultrasound imaging between two observers revealed, 122 cases were consistently

Table 2. Diagnosis of severity of intra- abdominal adhesions based on sliding sign on transabdominal ultrasound (US) and findings during caesarean section (CS) in women undergoing repeat CS (*N* = 265).

Surgical findings	Ultrasound findings			
	No/mild adhesion	Moderate adhesion	Severe adhesion	Total
No/mild adhesion	113	12	13	138
Moderate adhesion	9	32	11	52
Severe adhesion	6	14	55	75
Total	128	58	79	265

Table 3. Diagnostic accuracy of ultrasound in identification of adhesions among women with repeated cesarean section at KCMC (*N* = 265).

Ultrasound findings	Surgical findings		
	Adhesion	No adhesion	Total
Adhesion	112	15	127
No adhesion	25	113	138
Total	137	128	265

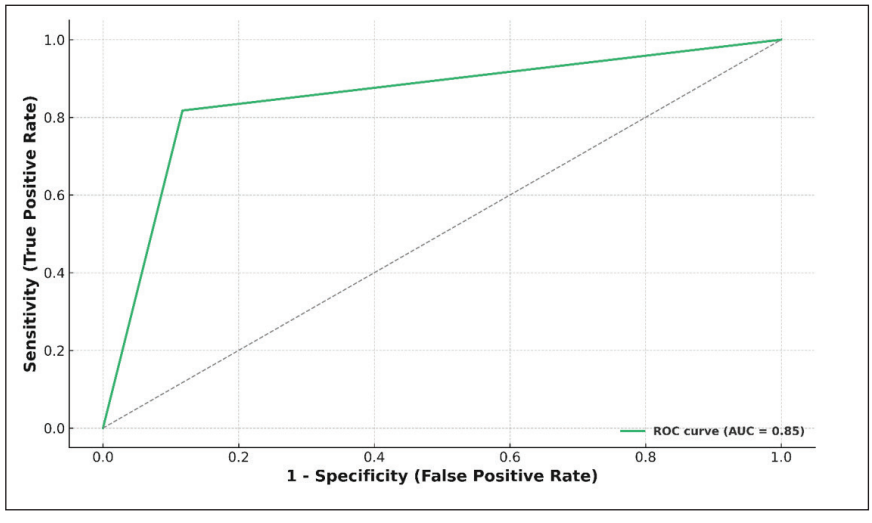


Figure 2. Receiver operating curve, ultrasound versus surgical findings in detecting adhesions.

labeled as "No adhesion" by both observers, and 96 participants were consistently labeled as having adhesions by both observers. Cohen's Kappa indicated a statistically significant substantial agreement between observer 1 and observer 2 κ; 0.64, p-value < 0.001 (Table 5).

Distribution of postoperative outcomes by ultrasound findings

Participants with a negative sliding sign on ultrasound experienced significantly longer surgical times compared to those with a positive sliding sign. The mean skin-to-delivery time was 4.03 minutes longer for the negative sliding sign group (p < 0.001). Correspondingly, the total operating time was also substantially extended by 14.2 minutes in the negative sliding sign group (p < 0.001). However, no statistically significant differences were observed in the incidence of visceral injury, estimated blood loss, or the 5th-minute APGAR scores between the two groups (Table 6).

Discussion

This study evaluated the clinical utility of the SSS in predicting intra-abdominal adhesions in third-trimester women who underwent repeat cesarean delivery at KCMC.

Table 4. Intra-observer reliability of ultrasonographic findings among women with repeated cesarean section at KCMC (*N* = 265).

Observer 1 ultrasound findings	Observer 1 repeat ultrasound findings		
	No adhesion	Adhesion	Total
No adhesion	133	4	137
Adhesion	28	100	128
Total	161	104	265

*Cohen's Kappa; 0.76.

Table 5. Inter-observer agreement of ultrasonographic findings (*N* = 265).

Observer 1 ultrasound findings	Observer 2 ultrasound findings		
	No adhesion	Adhesion	Total
No adhesion	122	15	137
Adhesion	32	96	128
Total	154	111	265

*Cohen's Kappa; 0.64.

Table 6. Distribution of postoperative outcomes by ultrasound findings (adhesion *vs.* no adhesion (*N* = 265).

Outcome variables	Ultrasound findings		
	Positive sliding (+)	Negative sliding (–)	*p*-value
Visceral injury			
No	134 (51.3)	127 (48.7)	0.347
Yes	1 (25%)	3 (75%)	
APGAR score-5th minute			
Mean (CI)	9.9 (9.83,9.97)	9.8 (9.59,9.91)	0.107
Estimated blood loss			
Mean (CI)	427 (407, 446)	453 (433, 473)	**0.066**
Skin to delivery time			
Mean (CI)	10.39 (8.9, 11.9)	14.42 (12.4, 16.5)	**<0.001***
Total operating time			
Mean (CI)	64.4 (60.9, 67.8)	78.6 (72.2, 85.0)	**<0.001***

*Significant difference at *p*-value of < 0.05: CI = confidence interval.

Bolded *p*-values represent statistically significant differences ($p < 0.05$) or a trend toward significance ($p = 0.05–0.10$).

Diagnostic accuracy of the SSS in adhesion prediction

The SSS demonstrated a high overall diagnostic accuracy in identifying intra-abdominal adhesions when compared with intraoperative surgical findings as the gold standard. When predicting the presence or absence of intrabdominal adhesions, the sensitivity was 81.8%, specificity was 88.3%, NPV of 88.2% and PPV of 81.9% findings that were similar to previous studies, which have shown a good sensitivity with a slightly higher specificity [9,12,13]. The AUC of 0.85 reflected excellent overall diagnostic performance for the test. The ROC curve's steep rise indicated that choosing a lower diagnostic threshold, such as restricted sliding instead of only its complete absence, achieves a high sensitivity with only a minimal increase in the false positive rate (1-specificity). Clinically, this approach improves the detection of intra-abdominal adhesions preoperatively while keeping the rate of false alarms low. The findings are in contrast to the study by Shu [16], who had a lower overall sensitivity and a modest overall specificity, with population differences likely contributing to the different results, as this study's population had a higher prevalence of

dense adhesions (51.7%) that favor the diagnostic performance of the SSS [13]. The higher parity of the study population and higher proportion of women with ≥2 prior CS (about 42%) being the reason for a higher prevalence of dense adhesions [1,4]. Diagnostic accuracy varied by adhesion grade, similar to the study by Bukar et al. [10], where in this study, the tool was least accurate for moderate adhesions, with a sensitivity of 61.5% and this was potentially due to subjectivity in characterization of the sonographic and surgical findings despite using a standardized tool.

Reliability of the SSS in adhesion prediction

The intra- and inter-observer reliability of the sliding sign was evaluated using both detailed adhesion grading and a binary adhesion/no adhesion approach. Intra-observer agreement was substantial ($\kappa = 0.76$, $p < 0.001$), indicating consistency by the same examiner, aligning with previous studies [10,12]. Inter-observer agreement was moderate but acceptable ($\kappa = 0.64$, $p < 0.001$), slightly higher than reported elsewhere [12,16], with longer cine clip duration likely contributing to improved results. Most discrepancies occurred between adjacent adhesion severity categories, reflecting the inherent subjectivity of interpretation. Clinically, reliability can be improved through repeated assessments in the third trimester and secondary review in uncertain or critical cases. Overall, the findings show that with standardization and adequate training, the SSS is a reproducible tool for evaluating intra-abdominal adhesions.

Association between the SSS and immediate postoperative outcomes

The SSS was evaluated in relation to immediate postoperative outcomes. A negative sliding sign was associated with significantly longer surgical times, with skin-to-delivery and total operating time being increased by 4.02 and 14.2 minutes, respectively ($p < 0.001$). These findings align with some previous studies [13,14] but differ from the study by Shu [16], likely due to the higher proportion of women with dense adhesions. The prolonged surgical times reflect the test's accuracy in detecting dense adhesions, which are known to complicate surgery [4]. No significant differences were found in visceral injury, APGAR scores, or blood loss, though trends toward higher blood loss ($p = 0.066$) and increased visceral injury (three of four cases) were observed in the negative sliding sign group. The low overall rate of visceral injuries may be due to the study setting in a tertiary center, where all surgeries were performed by experienced teams. Preoperative detection of a negative sliding sign can aid anesthesia planning, surgical team allocation, and anticipation of technical difficulty. In lower-level facilities, such findings may guide timely referral to higher centers and improve operating room resource management and patient safety.

Conclusion

This study evaluated the association of the severity of adhesions with the degree of sliding without excluding urgent cesarean sections yielding promising results. The study's primary limitations were its semi-quantitative grading of the sliding sign, which introduced subjectivity and lowered inter-observer reliability, and the single-point assessment, which may have missed some adhesions. Furthermore, it only evaluated immediate post-surgical outcomes, leaving a gap for long-term complications like hospital stay duration and wound healing. Despite these issues, the study maintained a high diagnostic accuracy and acceptable reliability. The sliding sign offers an effective, noninvasive, relatively simple, and reproducible preoperative screening tool for women with prior cesarean sections.

Acknowledgments

The authors extend their sincere gratitude to the faculty and staff of Kilimanjaro Christian Medical Centre for their essential support. They also thank colleagues, notably Dr. James Mboyerwa, for his inspiration and encouragement, and most importantly, the participants whose contributions made this study possible.

Conflict of interest

All authors declared no conflict of interest.

Funding

The principal author provided financial support for this research.

Ethical considerations

Ethical approval was obtained from KCMC University Ethical Review Committee with certificate number PG. 79/2024, and permission to conduct this study was sought from the director of KCMC and heads of departments. Written informed consent was

obtained from all the study participants with the possibility to withdraw from the study at any time also made clear to the study participants during recruitment. Privacy and confidentiality of the patients were maintained by using codes instead of names and registration numbers. Cine clips of the participants were not shared with any third party.

Availability of Data and Materials

All study data and related materials are available from the corresponding author upon request.

References

1. Mooij R, Mwampagatwa IH, Van Dillen J, Stekelenburg J. Association between surgical technique, adhesions and morbidity in women with repeat caesarean section : a retrospective study in a rural hospital in Western Tanzania. BMC Pregnancy Childbirth 2020; 8:4–9.
2. Boerma T, Ronsmans C. Global epidemiology of use of and disparities in caesarean sections – Authors' reply. Lancet 2018; 392(10155):1341–8; doi:10.1016/S0140-6736(18)32394-8
3. Ministry of Health (Tanzania Mainland). Tanzania Demographic and Health Survey and Malaria Indicator Survey (TDHS-MIS). Dodoma, Tanzania, and Rockville, Maryland, USA: MoH, NBS, OCGS, and ICF. 2022.
4. Nuamah MA, Browne JL, Öry AV, Damale N, Klipstein-Grobusch K, Rijken MJ. Prevalence of adhesions and associated postoperative complications after cesarean section in Ghana: a prospective cohort study. Reprod Health 2017; 14(1):143; doi: 10.1186/s12978-017-0388-0.
5. Arlier S, Seyfettinoğlu S, Yilmaz E, Nazik H, Adıgüzel C, Eskimez E, et al. Incidence of adhesions and maternal and neonatal morbidity after repeat cesarean section. Arch Gynecol Obstet 2017; 295(2):303–11; doi:10.1007/s00404-016-4221-8
6. Pergialiotis V, Frountzas M, Siotos C, Karampetsou N, Perrea DN, Efthymios Vlachos D. Cesarean wound scar characteristics for the prediction of pelvic adhesions: a meta-analysis of observational studies. J Maternal-Fetal & Neonatal Med 2017; 30(4):486–91; doi:10.1080/14767058.2016.1176135
7. Elprince M, Taha OT, Ibrahim ZM, Khamees RE, Greash MA, Atwa KA, et al. Prediction of intraperitoneal adhesions using striae gravidarum and scar characteristics in women undergoing repeated cesarean sections. BMC Pregnancy Childbirth 2021; 21(1):286; doi:10.1186/s12884-021-03763-z
8. Khlifi A, Meddeb S, Kouira M, Boukadida A, Hachani F, Chachia S, et al. Les caractéristiques de la cicatrice pariétale de césarienne sont des facteurs prédictifs des adhérences pelviennes. Étude de cohorte prospective. J Gynecol Obstet Biol Reprod (Paris) 2015; 44(7):621–31.
9. Mayibenye M. OC02.08: preoperative prediction of severe intraperitoneal adhesions in women undergoing repeat Caesarean section using clinical signs and the sliding sign. Ultrasound Obstetrics & Gynecology 2023; 62(S1):6.
10. Bukar M, Mana AU, Ikunaiye N. Preoperative sonographic prediction of intra-abdominal adhesions using sliding sign at repeat caesarean section at the University of Maiduguri Teaching Hospital, Nigeria: a prospective observational study. BMJ Open 2022; 12(1):1–6.
11. Yosef AH, Youssef AEA, Abbas AM, Mohamed AA, Mostafa SM, Ibrahim MN. The use of ultrasound sliding sign for prediction of adhesions in women undergoing repeated caesarean section. J Obstet Gynaecol. 2023; 43(1):2114333; doi: 10.1080/01443615.2022.2114333
12. Baron J, Tirosh D, Mastrolia SA, Ben-Haroush Y, Schwartz S, Kerner Y, et al. Sliding sign in third-trimester sonographic evaluation of intra-abdominal adhesions in women undergoing repeat Cesarean section: a novel technique. Ultrasound Obstet Gynecol. 2018; 52(5):662–5; doi: 10.1002/uog.19057
13. Charernjiratragul K, Suntharasaj T, Pranpanus S, Chanwadi S, Kwankaew N, Petpichetchian C. Preoperative sonographic sliding sign for prediction of intra-abdominal adhesions before repeat cesarean delivery. Int J Gynecology Obstetrics 2023; 161(1):250–4.
14. Drukker L, Sela HY, Reichman O, Rabinowitz R, Samueloff A, Shen O. Sliding sign for intra-abdominal adhesion prediction before repeat cesarean delivery. Obstetrics Gynecology 2018; 131(3):529–33.
15. Zühlke HV, Lorenz EM, Straub EM, Savvas V. Pathophysiologie und Klassifikation von Adhäsionen [Pathophysiology and classification of adhesions]. Langenbecks Arch Chir Suppl II Verh Dtsch Ges Chir. 1990; 1009–16.
16. Shu W. Predicting Intra-abdominal Adhesions for Repeat Cesarean Delivery with the Ultrasound Sliding Sign. J Obstetrics Gynaecol Can 2021; 43(11):1274–8; doi:10.1016/j.jogc.2021.05.011